REMARKS

Claims 37-39 and 41-64 are pending in the present Application. No claims have been cancelled or amended. Reconsideration and allowance of the claims are respectfully requested in view of the above amendments and the following remarks.

Claim Rejections Under 35 U.S.C. § 112, First Paragraph

Claim 54 stands rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Applicants respectfully traverse this rejection.

In particular, the Office Action states that the recitation in claim 54, lines 5-6, of "and mixtures thereof" does not appear to have support in the specification. 07/27/2009 Office Action page 6, para. 1.

The Examiner's attention is directed to page 12, paragraph [003]: "In yet another embodiment, an aqueous or organic silica sol, as described above is mixed with one or more other particulate filler materials … Examples of suitable micro-particulate glass or ceramic materials include, but are not limited to….[materials in claim 54]." [Emphasis added.]

Claim Rejections Under 35 U.S.C. § 103(a)

Obviousness Over Zhang

Claims 37-39, 41-43, 47-56, 58, 59, 63, 64 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Zhang (US 6387981). The Office Action states:

> Zhang teaches a dental material having silica particles less than 100 nm (Col. 5) which is surface treated with a silane (Col. 6, lines 1-19) and which may have additional ceramic filler (Col. 7, lines 4-10) as well as opacifying oxides (Col. 6, line 38 to Col. 7, line 3) wherein the silica comprises fumed silica (col. 5) including a hardenable resin (col. 2).

> Zhang teaches a method of heating a silica sol in accordance with the invention, which includes heating a silica sol at a temperature of 600°C (col. 14, lines 57-60, heating step as taught in 091428,830 (page 30, lines 10-1 5 of specification) incorporated into Zhang by reference, col. 15, lines 1-5, the clusters are made up of silica sols)....
>
> Additionally, one of ordinary skill in the art would recognize that in forming clusters, chains would inherently be formed in the cluster making process (Fig. 1). Additionally, it appears that Zhang contemplates a cluster (which meets the limitation of chains, as described above) that exhibits a crystallinity index of less than 0.1 on a scale of 0.0-1.0 (Zhang, col. 14, lines 31-43). It appears that a crystallinity index of 0.099 is within the scope of these respective disclosures. Therefore, it appears that at least one crystalline phase is formed in the clusters of Zhang.

[07/27/2009 Office Action page 7, para. 1, to page 8, para.1.]

This rejection is traversed for the following reasons. Initially, it should be noted that the Office Action refers to fumed silica, whereas the cluster in Fig. 1 is not fumed silica. Thus, the logic of the rejection appears faulty or unclear. Correction or clarification is respectfully requested.

As Applicants pointed out in their previous response of February 27, 2009, Zhang fails to teach (1) drying a sol comprising individual silica nanoparticles in the form of chains having lengths of about 5 to about 400 nanometers; and (2) heating the dried silica sol to a temperature of at least about 800°C and for a time effective to form at least one crystalline phase within the resulting silica material. Each of these two aspects of the presently claimed invention will be discussed in turn.

First, nowhere does Zhang remotely teach individual silica nanoparticles of a sol in the form of chains having lengths of about 5 to about 400 nanometers, which clearly means that such nanoparticles are individually colloidally dispersed, as single primary nanoparticles, as required by the present claims in light of the specification. Thus, an important difference between Zhang and the presently claimed invention is the presence, in a sol used to make the filler, of colloidally dispersed individual silica nanoparticles in elongated form comprising a chain of "particles" bound to each other so as to construct a single chain-form primary particle. This differs from both spherical nanoparticles and fumed silica as the starting material, whichever the Examiner intends to rely on in the prior art.

The colloidal silica of Zhang, as used in the examples and as shown in Fig. 1, comprises substantially spherical particles, which are monodispersed to make a product. Thus, the NALCO or LUDOX colloidal silica products in the examples of Zhang are generally non-aggregated (i.e., individually dispersed particles), in the form of substantially spherical silica particles, when dispersed in an aqueous or organic media.

Zhang states: "The silica used in the materials of the present invention are preferably substantially spherical and substantially non-porous...Preferred silicas for use in the materials of the present invention are ....NALCO COLLOIDAL SILICAS." [col. 5, lines 58-61.] Various evidence has been provided to the Examiner supporting this factual conclusion, including an affidavit and other references describing the difference between colloidal silica and fumed silica. See, for example, the Declaration under 37 CFR 1.132 submitted in Applicants' Amendment of April 23, 2007, or the Wikipedia reference submitted in Applicants' Amendment of February 27, 2009, both of which establish that Fig. 1 of Zhang shows substantially spherical colloidal particles, not fumed particles.

Thus, Zhang discloses a material composed of an "association" or "clump" of discrete individual substantially spherical nanoparticles. (Col. 14, lines 21-23.) The cluster is not made up of individual chain-form nanoparticles. Zhang states as follows:

> Typically the non-heavy metal oxide particles of the clusters are associated by relatively weak intermolecular forces that cause the non-heavy metal oxide particles to clump together, even when dispersed in a hardenable resin for a dental material....To the extent that the heavy metal oxide is present in the cluster as particles, the heavy metal oxide particles display a similar association to each other and to the non-heavy metal oxide particles." [Column 14, lines 24-31.]

Clumps are not chains, nor are they clumps of chains. To assert otherwise is contrary to the evidence, without support. Zhang cites U.S. Patent Application Serial No. 09/428,830, now U.S. Patent No. 6,730,156 to Windisch, hereafter "Windisch") for the process of making the clusters. Windisch states that, "The resulting fillers are weakly bound aggregates or clusters of discrete primary particles which are clustered together…." (Emphasis added, column 20, lines 14-19, of Windisch.) Aggregates of chains cannot be expected. Furthermore, the Examiner has failed to identify the lengths of the alleged "chains" within the cluster in Fig. 1 of Zhang. Hence, what basis is there for these unidentified alleged "chains" in Fig. 1 to have the presently claimed lengths of the elongated nanoparticles?

In contrast to either Zhang's clusters, fumed silica, or spherical monodispersed colloidal silica, the elongated silica nanoparticles used to make the presently claimed fillers are the kind of colloidal silica disclosed in U.S. Patent No. 5,221, 497 to Watanabe et al. (hereafter "Watanabe"). Watanabe, for example, discloses making the elongated silica nanoparticles by mixing a small amount of water-soluble calcium and magnesium salts with silicic acid, among other features of a complex process. (Watanabe, Abstract.) The result is that "part of the active silicic particles, which have captured the calcium ions and/or magnesium ions therewith, would be chain-like coagulated in a row thereby forming string-like elongated coagulated particles which may be angled in any direction." (Watanabe, col. 7, lines 24-29.) Such particles are shown in Fig. 1 of Watanabe. Zhang does not remotely show or teach the use of such elongated nanoparticles.

Second, the present invention is distinguished from Zhang by requiring a filler obtained by heating the dried silica sol to a temperature of at least about 800°C and for a time effective to form at least one crystalline phase within the resulting silica material. In particular, a further distinction of the present invention is that the colloidal silica particles, initially amorphous in the sol, are effectively treated to obtain crystal structure. Only after heating at very high temperatures do the present elongated nanoparticles effectively form a crystalline phase.

In fact, it should also be noted that Zhang fails to teach heating any dried silica sol to a temperature of at least about 800°C for a time effective to form at least one crystalline phase within the resulting silica material. Although the Office Action cites heating in Zhang (col. 14, lines 57-60) with respect to the above-discussed clusters, the intended result of such heat treatment is a substantially amorphous cluster that is essentially free of crystalline structure. (Zhang, column 14, lines 10-13 and 32-42.)

In particular, Zhang discloses in columns 14, line 10, to column 15, line 42, that the clusters are "substantially amorphous," which is defined to mean that "the clusters are essentially free of crystalline structure…." Zhang further states that the fillers of the invention "preferably have an index of less than about 0.1; more preferably less than about 0.05" on the Crystallinity Index where 1.0 is indicative of a full crystalline structure and "a value near zero indicates presence of amorphous phase only." (Zhang, Col. 14, lines 32-42.)

Furthermore, although Zhang teaches a heat treatment, not only are the resulting clusters described as essentially free of crystalline structure, but also there is a positive teaching that crystallinity is to be avoided by limiting the heating temperature. In particular, Zhang refers, as noted by the Examiner, to the above-mentioned U.S. Patent Application Serial No. 09/428,830 (U.S. Patent No. 6,730,156 to Windisch et al.) as teaching, with respect to the clusters, calcining at a temperature of 200°C to 800°C, more preferably about 300 to 600°C, in order "to further remove residual organics." Windisch further states that this calcining "allows the filler to become more brittle, which results in more efficient particle size reduction." (Column 19, lines 56-61, of Windisch.) Of particular relevance, Windisch states:

> The provision of substantially amorphous clusters may be facilitated by the appropriate selection of heat treatments, for example, by maintaining the temperature of a heat treatment at a level that is sufficiently low that essentially no crystallinity is found after milling." (Column 18, lines 62-67.)

In response to this relevant quote, the Examiner argues that the present claims do not claim crystallinity after milling, but crystallinity after heating. 07/27/2009 Office Action page 4, para. 5. However, it seems inexplicable that the Examiner would consider milling to change the crystallinity when all the references teach that heating causes crystallinity, not milling.

Furthermore, the Examiner has conceded that Zhang fails to teach the obviousness of heating to 800°C. A previous Office Action (12/09/09 at page 3, para. 1) stated:

> Zhang teaches a method of heating a silicic sol in accordance with the invention, which includes heating a silica sol at a temperature of 600°C (col. 14, lines 57-60), heating step as taught in 09/428,830 (page 30, lines 10-15 of specification) incorporated into Zhang by reference, col. 15, lines 1-5....

12/09/09 Office Action page 2, last paragraph. [Emphasis added.]

In fact, the cited reference to SN 09/428,830 (corresponding to published US 6730156 to Windisch) teaches a temperature of 550°C in the examples, as shown in col. 25, line 59, of the patent.

Thus, even with the combined teaching of Zhang and U.S. Patent Application Serial No. 09/428,830, the heat treatment disclosed in Zhang produces, starting with monodispersed substantially spherical colloidal particles, a dried material that is a "substantially amorphous" cluster of non-heavy metal oxide and a heavy metal oxide, and does not produce, starting from a sol comprising individual particles of elongated silica in the form of chains, a material having a crystalline phase according to the instant claims.

In distinct contrast to the teachings of Zhang/Windisch, the elongated silica nanoparticles used in making the present filler (for example, Snowtex PS-M colloidal silica, commercially available for Nissan Chemical Company) obtains, when heated, a crystalline phase shown in the X-ray diffraction patterns of Fig. 1 provided in the present application with reference to Example 8 on page 24. Without wishing to be bound by theory, the crystalline phase produced in the present fillers may be a result of an accelerated crystal growth due to the content of CaO and/or MgO resulting from the process of forming the special elongated silica particles used to make the presently claimed product. It is respectfully submitted that one of ordinary skill in the art would expect that the result of such a heat process, involving a temperature of 800°C in Example 8, would have been unpredictable, depending on the particular silica material involved.

The Examiner has not disputed that changing the temperature of heating at or above 800°C is associated with more crystallization than heating at 600°C. Furthermore, in accordance with present claims 47 and 51, the present Figure 1 shows that the required heating at 800°C can, in fact, effectively cause effective crystallinity in the product.

The unpredictability of heat treatment of different silica materials is further evidenced by the fact that the cluster material of Zhang/Windisch, after heating, is relatively less dense and has higher surface area. Windisch states:

> The fillers of the invention are preferably not fully densified. The term "fully dense," as used herein, is descriptive of a particle that is near theoretical density, having substantially no open porosity…the fillers of the invention are often manufactured in a process that includes heat treatment. The surface area of the filler after heat treatment compared to its surface area before heat treatment is preferably quite high. The ratio of the surface area after heat treatment compared to the surface area before heat treatment is preferably greater than about 50%, more preferably greater than about 80%. [Col. 4, line 63, to col. 5, line 17.]

In contrast, the surface area and the porosity of the filler according to the present invention, for example, after heating the elongated nanoparticles at 1100°C, as determined by BET, was found to decrease. In fact, the heated and crystallized filler was found to approach a fully densified value and to contain substantially no open porosity, quite contrary to the filler and teachings of Zhang/Windisch. Therefore, the heat treatment in Zhang/Windisch evidently does not produce the claimed product, but a significantly different product, both in terms of properties and structure, as shown by various submitted evidence described by the Applicants, which cannot properly be ignored by the USPTO.

In summary, therefore, Applicants respectfully submit that the rejection of the present claims is based on a mistaken or incomplete understanding of Zhang. First, Zhang has nothing to do with individual elongated nanoparticles in the form of chains, as presently claimed, which can be individually dispersed in the sol or can be dried without loosing its structure. As stated in the specification, the nanoparticles are believed to retain their unique nanostructured character in the final product. Page 12, para. [0031]. Thus, such nanoparticles form a different structure in the claimed product than in the prior art product. Second, the heating of the elongated nanoparticles, at a relatively higher temperature, in the present invention is designed to produce crystallinity in the elongated silica nanoparticles, which also results in a different structure and properties, in terms of crystallinity, density, and surface area or porosity. In contrast, the cited prior art (involving a different material heated at a substantially lower temperature) is purposely designed to produce essentially no crystallinity in clusters of spherical particles, the process of which is instead intended to remove residual organics and increase surface area. Further, the present invention uses elongated nanoparticles that, among other features, are formed by mixing calcium and magnesium salts with silicic acid. The Examiner has provided no evidence or reasons to expect heating such a different composition at a temperature 200°C higher than in the prior art would result in the same product or the same crystal structure as shown in Fig. 1 of the application.

In view of the above, an improved filler product is obtained. This product, based on the clearly unobvious process limitations and ingredients, has improved strength for use in a dental composite, including improved fracture resistance as a result of the elongated silica nanoparticles, as described on page 11, paragraph [0030].

Thus, the Applicants respectfully request reconsideration and removal of the §103(a) rejection of claims 37-39 and 41-43.

Obviousness Over Zhang + Bullock

Claims 44-46 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Zhang (US 6387981) in view of Bullock (US 4180911). Applicants respectfully traverse this rejection.

Zhang was discussed above. Bullock is cited for teaching the treating of the surface of a dental material with the specific silanes of claim 44. 07/08/2009 Office Action page 10, paragraphs 3-4.

Claims 44-46 are patentable for at least the reason that they depend from independent claim 37, discussed above. Bullock fails to correct the above noted deficiencies of Zhang. Indeed, Bullock specifically discloses silane-treated amorphous silica and not a silane-treated silica material having at least one crystalline phase. As the combined references fail to teach or suggest all of the required claim limitations of claim 37, the references have not rendered obvious claims 44-46. Reconsideration and withdrawal of this rejection are respectfully requested.

Obviousness Over Zhang + McArdle

Claims 55, 56, 57 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Zhang (US 6387981) in view of McCardle [sic. McArdle] et al. (US 6620214). Applicants respectfully traverse this rejection. The Office Action states:

> Zhang fails to teach the proportions of 40-90 percent by weight of silica and 1-20 percent by weight of microparticulate filler. McCardle [sic], however, teaches a method of making a ceramic binder useful in the dental art (col. 1, 18) wherein the percent weight of ceramic binder is 11 -63% (borosilicate glass is ceramic binder, col. 6, 13) and the percent weight of solid particulates is 29-81 % (silica is a solid particulate, col. 8, 13).

[07/08/2009 Office Action page 11, paragraphs 1-2.]

Zhang is discussed above. McArdle is directed to methods for making ceramic aggregate particles by forcing the composition through at least one orifice in a substrate. Such particles are not made out of elongated chain-form nanoparticles, as pictorially shown in Fig. 1 of McArdle. The solid particulates that the Office Action asserts corresponds to the presently claimed nanoparticles are merely described as "silica," included in a long list ranging from metal carbonates to vermiculite. (Silica is filler material number 18 on the list of 47 of possible filler materials.) See col. 8, lines 1-19. The average particle size is given as 0.5 to 1500 micrometers, preferably 125 to 1500 micrometers, which is outside the presently claimed range of 5 to 400 nanometers. McArdle's aggregate particles are useful for abrasives, roofing granules, brake linings, dental compositions, and assorted other uses. Silicon carbide particles rather than elongated chain-form silica nanoparticles are used in the Examples. Thus, it is apparent that McArdle cannot correct the above-noted deficiencies of Zhang.

Obviousness Over Zhang + Windisch

Claims 60 and 61 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Zhang (US 6387981) in view of Windisch et al. (US 6730156). Applicants respectfully traverse this rejection. The Office Action states:

> Zhang fails to teach pulverizing the calcined filler. Windisch, however, teaches pulverizing a calcined material for the purpose of obtaining a particle size of less than 2 micrometers (col. 20). Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide pulverizing the filler of Zhang in order to obtain a particle size of less than 2 micrometers (col. 20) as taught by Windisch.

[07/08/2009 Office Action page 12, paragraphs 3-6.]

Claims 60 and 61 are patentable for at least the reason that they depend from independent claim 52, discussed above. Thus, Windisch fails to correct the above noted deficiencies of Zhang. Indeed, Windisch discloses essentially the same clusters as Zhang, which incorporates by reference the Windisch application that was issued as the cited patent to Windisch. As the combined references fail to teach or suggest all of the required claim limitations of claim 52, the references have not rendered obvious claims 60 and 61. Reconsideration and withdrawal of this rejection are respectfully requested.

Obviousness over Zhang + Waknine

Claims 62 stands rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Zhang (US 6387981) in view of Wankine [sic. Waknine] (US 5276068). Applicants respectfully traverse this rejection. The Office Action states:

> Zhang fails to teach that the microparticulate filler is barium borosilicate glass. Wankine [sic. Waknine], however, teaches a dental composition (col. 1) wherein it is known to use barium borosilicate glass as a filler (col. 10). Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide barium borosilicate glass in Zhang in order to provide a known filler in the dental composition art (col. 10).

[07/08/2009 Office Action page 13, paragraphs 3-5.]

Claim 62 is patentable for at least the reason that it depends from independent claim 52, discussed above. Waknine fails to correct the above noted deficiencies of Zhang. Indeed, Waknine is directed to a filler material composed of borosilicate glass rods having an average particle size diameter of 10 microns, not combined with silica nanoparticles, and heated only to a temperature of 120°C. Col. 17, lines 23-55, and col. 11, lines 44-50. As the combined references fail to teach or suggest all of the required claim limitations of claim 52, the references have not rendered obvious claim 62. Reconsideration and withdrawal of this rejection are respectfully requested.

"A patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1741 (2007). To find obviousness, the Examiner must "identify a reason that would have prompted a person of ordinary skill in the art in the relevant field to combine the elements in the way the claimed new invention does." *Id.*

Examiner's Response to Arguments

The Office Action states that Applicants' arguments filed 2/27/09 have been carefully considered but they are not persuasive. 07/27/2009 Office Action page 2, para. 1. In considering the Examiner's response, however, Applicants respectfully submit that the rejections are improper for several reasons. First, the USPTO has misinterpreted the claims. Second, the USPTO has explicitly applied the wrong standard of patentability in the rejections. Third, the USPTO has misinterpreted the prior art references, and the rejections are clearly wrong on the facts.

Improper Interpretation of Patent Law and the MPEP:

First, regarding the improper application of patent law, the Office Action states:

> When the examiner has found a substantially similar product as in the applied prior art, the burden is shifted to the applicant to establish that their product is patentably distinct and not the examiner to show the same process as making. *In re Brown.* 173 USPQ 685 and *In re Fessman,* 180 USPQ 324.

[Emphasis added, page 3, para. 4, and again on page 8, last paragraph, to page 9, first paragraph, and a third time on page 12, first paragraph.]

Three times the Office Action asserts the above quoted statement in support of the rejections. However, neither the MPEP nor the cited cases support this asserted basis of the rejections. In fact, the cases do not state that the burden shifts when the examiner has found a substantially similar product, but rather that the burden shifts when the prior art discloses a product which "reasonably appears to be either identical with or only slightly different from a product claimed in a product-by-product claim." Clearly, there is a critical difference between the correct standard and the incorrect standard applied in the Office Action. It would indeed make it easy for an Examiner to reject a claimed invention if merely "substantial similarity" allowed Examiners to unreasonably demand difficult and expensive comparative testing of whatever composition in the prior art was considered substantially similar. Thus, MPEP 2113 states, in bold capitalized letters, "ONCE A PRODUCT APPEARING TO BE SUBSTANTIALLY IDENTICAL IS FOUND…THE BURDEN SHIFTS TO THE APPLICANT TO SHOW AN UNOBVIOUS DIFFERENCE." [Emphasis added only by the underlining.] The Office Action, three times, replaces "substantially identical" with "substantially similar." In effect, the Examiner has conceded that the prior art is, at most, only substantially similar, not substantially identical. Hence, the Examiner has improperly required evidence of unexpected properties, based on false assertions of patent law, contrary to the MPEP and the judicially applicable case law. Hence, the final rejections were improperly made and should be withdrawn.

The Office Action Has Misconstrued the Claims:

The Office Action states:

> Applicant argues that the colloidal particles have a unique elongated chain form, which are individually dispersed as in a sol and that individual nanoparticles of the sol are in the form of chains, which is nowhere taught by Zhang. However, the claim is open to, and does not exclude, the interpretation that the amorphous silica nanoparticles are composed of smaller primary particles.

[07/27/2009 Office Action page 2, para. 1.]

However, the present claims recite, "individual nanoparticles" (Claim 1). Clearly, based on the specification, these are not made up of other discrete smaller primary particles. The Applicants respectfully request the Examiner to provide the grounds for interpreting an "individual nanoparticle" as a collection of other "smaller primary particles." No such basis exists for the Examiner to thusly misinterpret Applicants' claim language, reading "secondary" particle into the claim. Furthermore, claim 51 explicitly states that the silica nanoparticles comprise "colloidal particles bound to each other in the forms of chains" while in the sol. The claims clearly refer to the chemically bound coagulated particles described and actually used in the specification and examples. Thus, secondary particles made up of primary particles are positively excluded by claim 51, by the plain meaning of words read in light of the specification. Further, the Examiner has failed to provide any teaching or example of primary particles forming a chain in a sol, in comparison to the colloidal particles specifically taught and disclosed in the present specification.

The Examiner has also misinterpreted the claims by stating that "The claims do not require that the chains are not formed from discrete particles." 07/27/2009 Office Action page 2, para. 5. In fact, they do. Still further, Applicants' previous Amendment explained why the claims do not cover fumed silica, i.e., "secondary particles formed from primary particles." This fact could not be plainer, unless Applicants were to amend the claims to state, "individual nanoparticles in the form of chains that are not secondary particles of fumed silica containing discrete primary particles." It is respectfully submitted that demanding such detail in a claim would be arbitrary and capricious.

The Office Action states that claims are to be interpreted in light of the specification, relying on In re Van Geuns, 26 USPQ2d 1057 (Fed. Cir. 1993). This does not mean that the claims are to be interpreted in light of the specification only if such an interpretation does not limit the claim. Rather it means that limitations from the specification are not read into the claims when they are not the result of interpreting the claims in light of the specification. Accordingly, the Examiner is required to read and consider the specification as well as the claims to support a rejection. The claims of a patent are given their "broadest *reasonable* interpretation *consistent with the specification*." [Emphasis added.] In re Hyatt, 54 USPQ2d 1664, 1667 (Fed. Cir. 2000). If a term is used in a consistent manner throughout a patent application, that usage may determine the meaning of the term in the claims. In re Baker Hughes, Inc., 55 USPQ2d 1149, 1151 (Fed. Cir. 2000). The broadest reasonable interpretation of the claims must also be consistent with the interpretation that those skilled in the art would reach. MPEP 2111.

Still further, the Office Action has misconstrued the claim language by disregarding and/or distorting the plain meaning of the word "chain" in an effort to avoid the subject matter of the claimed invention, in fact, a critical feature of the claimed invention, as explained below with respect to the cited Zhang reference.

The Office Action Is Mistaken on Issues of Fact with Respect to the Prior Art:

The Office Action states that "one of ordinary skill in the art would recognize that in forming clusters, chains would inherently be formed in the cluster making process. (Fig. 1)," referring to Fig. 1 of Zhang, cited in all the rejections.

However, to suggest that Fig. 1 of Zhang shows a cluster composed of chain-form primary particles is frankly inexplicable. Even if it is conceivable that a single elongated chain might be fortuitously found within the cluster shown in Fig.1 of Zhang, that is *clearly not the same as all the silica nanoparticles in the product being produced as a result of drying individual elongated chains*. Such a product would be substantially different, not identical or even slightly different.

Thus, contrary to the Final Rejection, it is not a matter of no significance, as asserted in the Final Rejection, that the filler or clusters of Zhang are not made from monodispersed individual elongated nanoparticles in a sol, as presently claimed. Rather, it is very relevant that the basic ingredient used in making the product is different. This results in a different product, as one of ordinary skill in the art would readily appreciate. Different kinds of silica have different properties. Fumed silica, for example, is very different from colloidal silica in various properties, as explained in Applicants' previous Amendment. There is no basis for the Office Action to group all kinds of silica together and say they produce the same product for examination purposes. That is clearly contrary to the view of one or ordinary skill in the art.

The Office Action states:

> It appears that applicant is attempting to distinguish the instant invention from the prior art as to when the chains are formed and whether the chains are made up of discrete particles or not. However, the point in time in the reaction in which the chains are formed appear to be product by process steps. [07/08/2009 Office Action page 3, para. 3.]

The Examiner has factually misinterpreted the primary reference. In the present invention, the individual nanoparticles are in chain form in the sol, which, when dried, produces a related structure in the product. In contrast, in the prior art, individual spherical particles in a sol would never be converted to "chains" when dried. Although one might be able to imagine a single chain fortuitously existing in the cluster Fig. 1 in Zhang, the fact remains that the cluster would be different in structure from a product in which essentially all the silica is in the form of primary nanoparticles of elongated silica. Thus, the cluster of Zhang is never the same thing, in terms of a product. Drying chains will result in dried chains. Drying spherical particles will result in dried clusters of spherical particles. Hence, different product-by-process steps, including different kinds of materials used in the process, will evidently result in a different product.

Further, the Examiner states: "One of ordinary skill in the art would recognize that in forming clusters, chains would inherently be formed in the cluster making process (Fig. 1). There does not appear to be any evidence on the record to the contrary of this assertion." 07/27/2009 Office Action page 4, para. 1.

Applicants again submit that there is no evidence that individual spherical particles in Zhang would result in the same chains that are formed by dried chains. In view of the absence of any evidence of similar chains being created by Zhang, other than a cluster of particles in Fig. 1, it is believed unnecessary for Applicants to go to the expense of recreating the complicated composition in Zhang and then comparing products to prove a negative, that the cluster in Fig. 1 is not 'miraculously' made up of chains 5 to 400 nanometers in length. The starting materials are very different. There is no reason provided by the Examiner as to why a cluster of particles composed of substantially spherical particles would, at any time, form chains analogous to those characteristic of the present product, other than the fact that it might be difficult to determine that by looking at the image, in Fig. 1 of Zhang, of a cluster of the particles.

The Office Action factually misconstrues the prior art in another significant way. The Office Action states:

> Applicant argues that both Windisch and Zhang teach against forming a crystalline structure and that crystallinity is to be avoided; specifically that Windisch states that "essentially no crystallinity is found after milling."...It appears that at least one crystalline phase is formed from heating as the temperature is substantially similar (800°C) and that a crystallinity of 0.099 [on a scale of 0.0 to 1.0!] is within the scope of these respective disclosures. [07/27/2009 Office Action page 4, paragraphs 3 and 5.]

However, Zhang and Windisch, in fact do not effectively form a crystalline phase at a temperature substantially similar to 800°C, but rather at 550 or 600°C, as pointed out above. This is because, as stated, their purpose is to form essentially no crystalline phase. Thus, there is evidence that the crystalline phase in the present product will be different than in the product of Zhang, especially since the crystalline phase is explicitly desired and obtained by heating above the temperature that was actually used in Zhang. Thus, the evidence is clear, both in the prior art and the present application, that the crystallinity associated with heating at 600°C vs. 800°C is different, not even to mention the fact that different silica starting material are being heated.

The fact that the difference in crystallinity is not defined in the claims is not grounds for disregarding evidence of this difference in the claimed product-by-process product. It is respectfully submitted that it is not required that properties resulting from a product-by-process claim be in the claim. In fact, that is the purpose of a product-by-process claim, to claim a product that cannot be described only in terms of the product. The Applicant only needs to show that the product is different in properties as a result of the process, not define the difference in terms of properties in the claim. See MPEP 2113, "The structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product. In re Garnero, 162 USPQ 221, 223, (CCPA 1979).

Finally, the Office Action states:

> Applicant argues that the surface area and the porosity of the filler according to the present invention was found to decrease with heating, while the surface area and the porosity of the filler according to Windisch/Zhang was found to increase with heating is evidence of the unpredictability of heat treatments of different silica materials. However, it appears that a crystal phase is formed, as described above. Surface area and porosity of applicant's filler is a feature that is not claimed. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., surface area and porosity of the filler) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

[07/27/2009 Office Action page 5, para. 1.]

Again, the fact remains unrebutted by the Examiner that, based on factual evidence, the surface area and the porosity of the filler according to the present invention were found to decrease with heating, while the surface area and the porosity of the filler according to

Windisch/Zhang was found to increase with heating. This is a difference in the product, based on evidence, showing that the product is, in fact, not identical or slightly different form the prior art, but rather very different in terms of relevant properties. The argument of the Examiner seems to boil down to the fact that it is not in the claims. However, that is because it is a product-by-process claim. See, above, MPEP 2113 and In re Garnero, "The structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product. In re Garnero, 162 USPQ 221, 223, (CCPA 1979).

Conclusion

It is believed that the foregoing amendments and remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance are requested.

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130.

Respectfully submitted,

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